General and specific comments

The paper presents a critical overview of the isoprene emission estimates at European scale for present and end-of-century period, considering many of the most important factors that can drive isoprene emission changes such as CO_2 inhibition effect, CO_2 fertilizing effect and climate changes. It is remarkable the analysis on the different meteorological fields (ALARO and ERA-Interim), that greatly enriches the discussion. The paper is, in general, well written and organized. The results are clearly presented and discussed. I therefore recommend the publication of the present manuscript in Biogeosciences after having clarified the following points:

1) In section 2.2, the approximation used to derive the LAI before 2003 seems to me quite crude. Where does equation (6) come from? Could you please detail more the scientific basis of this formula? Please explain why you do not directly use other LAI databases that better cover the period of your analysis like GLASS Leaf Area Index product (http://glcf.umd.edu/data/lai/) or GIMMS (Zhu et al. 2009). I would suggest to compare the LAI that you calculate with at least one of these databases to discuss the quality of your formula.

2) In section 2.2, I am not sure to have understood the formula (7). If f_i is a monthly correction factor for each site, where is the information about the month as in right part of the formula there are only annual averaged variables?

3) I suggest to clearly indicate the spatial and temporal resolution for all simulations in Table 1 or in Section 2.2, where simulations are presented.

4) As you said at the end of Section 2.3, the increase of 15% of LAI per 100ppm of CO_2 is a quite crude parameterization. It is most likely that the various types of plants respond differently to CO_2 variation and the present parameterization do not take into account the dependency on Plant Functional Type (PFT). More generally the best way to model the future vegetation carbon balance (and so the LAI variation too) due to climate is to use dynamical vegetation models. The employ of this kind of models is beyond the scope of this paper, but I think that it's worth to discuss a little bit more this important point at the end of 2.3 section and insert a sentence in the perspective (see next point).

5) I would conclude with a short paragraph underlining the limits of this work, the possible evolution and future perspectives.

Technical corrections:

1) **Page 2, line 20**: there many more global annual emission estimates, please look to Fig. 1 in Messina et al (2016) or Fig. 10 in Sinderalova et al. (2014)

2) **Page 4, line 26**: the equation (6) is not well formatted, I see one part of the formula on the right and another part completely on the left side of the page.

3) **Page 8, lines 26**: how is the H3 simulation estimated at the field campaign locations? Is it simply a spatial interpolation?

4) **Page 10, lines 13-14**: could you please detail more the sentence *"An equally likely explanation is uncertainties associated with the activity factors representing the impact of past temperature and solar radiation in the MEGAN model (Eq. 2, 4)"*? For example clarifying in which way the activity factors γ_T and γ_P set in MEGAN can explain the differences between modeled and observed seasonal pattern of isoprene.

5) **Page 12, lines 9-13 and 28-33**: the two sentences *"Precipitation plays only…particular over southern Europe"* and *"As the present study neglects… regions (Bauwens et al., 2016)"* are both centered on soil moisture, I suggest to move the first sentence merging it with the second one.

6) **Page 12, lines 15-16**: you say that the effect of CO_2 fertilization increases by +15% for RCP4.5 and +32% for RCP8.5 compared to the simulation accounting only for climate effects, but is not it rather equal to 19% (that is 52−33=19) for RCP4.5 and 58% (141−83=58) for RCP8.5?

7) **Page 12, line 25**: the plots related to "climate+CO_2 fert+inh (WH)" configuration are not present in Fig. 9, so after the sentence "…between 11% and 65% (using Wilkinson et al. (2009))", I would put *"(not shown)"* or I would add the concerning plots in the Fig. 9.

8) **Page 13, line 3**: in the sentence *"The large dispersion of the different estimates of Fig. 9…"*, do you mean Fig. 10?

9) **Page 14, line 5**: instead of *"…to increase by up to 65%"*, I suggest to put the variability range.

10) **Page 18, line 24**: to respect the alphabetical order I would put "van der Schrier..." further.

Messina, P., Lathière, J., Sindelarova, K., Vuichard, N., Granier, C., Ghattas, J., Cozic, A., and Hauglustaine, D. A.: Global biogenic volatile organic compound emissions in the ORCHIDEE and MEGAN models and sensitivity to key parameters, Atmos. Chem. Phys., 16, 14169-14202, https://doi.org/10.5194/acp-16-14169-2016, 2016.

Sindelarova, K., Granier, C., Bouarar, I., Guenther, A., Tilmes, S., Stavrakou, T., Müller, J.-F., Kuhn, U., Stefani, P., and Knorr, W.: Global data set of biogenic VOC emissions calculated by the MEGAN model over the last 30 years, Atmos. Chem. Phys., 14, 9317–9341, doi:10.5194/acp-14-9317-2014, 2014.

Zhu, Z.; Bi, J.; Pan, Y.; Ganguly, S.; Anav, A.; Xu, L.; Samanta, A.; Piao, S.; Nemani, R.R.; Myneni, R.B. Global Data Sets of Vegetation Leaf Area Index (LAI)3g and Fraction of Photosynthetically Active Radiation (FPAR)3g Derived from Global Inventory Modeling and Mapping Studies (GIMMS) Normalized Difference Vegetation Index (NDVI3g) for the Period 1981 to 2011. *Remote Sens.* **2013**, *5*, 927-948.